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stars have been discovered within the last eight years, and it is very probable that many new additions will be made as the large refractors now in use engage in this work. This list would be much extended by including stars to which more distant companions have been detected, but most, if not all of them, are too distant to make any physical relation probable, and are of very little interest. The first column gives a number for reference; the second column, Struve's number; the third, the name of the principal star, when found in Flamsteed or Bode; the fourth, the distance of the stars recorded by Struve; the fifth, the distance of the new star; and sixth, the name of the discoverer.

Many of the close pairs are known to be binaries, and in some cases it is probable the three stars form one system. When any change has occurred, the most recent measures of distance are given.

## ASTRONOMY.

### SWIFT'S COMET.

A new determination of the orbit of Swift's periodic comet has just been made by Mr. Winslow Upton of the U. S. Naval Observatory, based upon observations made at Washington, October 25, November 23, and December 22, 1880. No assumption was made with regard to the period of resolution or the eccentricity. The following are the elements obtained, and communicated to the *Astronomische Nachrichten*:

Epoch, 1880, Oct. 25. 5 Washington mean time.

M	357° 48' 49.3"	} 1880.0
$\Omega$	296 41 55.4	
$\omega$	106 18 13.8	
$i$	5 31 3.5	
$\phi$	42 31 39.7	
log $\alpha$	0.518438	
$\mu$	592.0373"	

The period obtained from these elements is 2189 days, which confirms the fact already announced by Mr. Chandler and others that the comet has made two revolutions since its appearance in 1869. The period obtained is also nearly identical with that given by Prof. Frisby in "SCIENCE," which he derived from observations separated by intervals of only 13 days. The comet could not have been seen at its return in 1875, as the sun was between it and the earth, and it is probable that its next return in 1886 will be unobserved for the same reason, though a careful computation which shall take into account the perturbations of the comet due to the action of the planets will be necessary to determine the question.

Professor E. S. Holden, of the Naval Observatory at Washington, has accepted the managership of the Washburn Observatory in Madison, Wis., the position made vacant by the recent death of Professor Watson. Professor Holden will enter upon his duties in a few weeks.

ASTRONOMICAL MEMORANDA:— (Approximately computed for Washington, D. C., Monday, January 24, 1881.)

Sidereal time of Mean Noon. 20h. 16m. 37s.

Equation of time. . . . . 12 29

mean noon preceding apparent noon.

The Sun, having passed the winter solstice, has reached a declination of 19° 3' south.

The Moon reached its Last Quarter on Jan. 22d 16h., or 4 A. M. of Jan. 23.

New Moon comes on Jan. 29d. 8h., and the First Quarter on Feb. 5d. 8h. On the morning of the 24th the Moon crosses the meridian at about a quarter of seven.

Mercury, still invisible, comes into superior conjunction with the sun on the 26th, passes to his eastern side, and becomes evening star. Mercury is in conjunction with the Moon on the morning of Jan. 30.

Venus is evening star, and throughout the month increases her distance from the sun as she approaches the earth. She follows the sun by nearly three hours and is 3° south of the equator.

Mars is morning star, rising about six o'clock, and slowly traveling away from the sun.

Jupiter, evening star, crosses the meridian about half past four:—R. A. oh. 53m., Dec. 4° 21' north.

Saturn is also evening star, having reached quadrature, or halfway from opposition to conjunction, on the 12th, when he was on the meridian at six. Saturn and Jupiter, it will be noticed, are still steadily approaching each other.

Uranus crosses the meridian at about 3 o'clock in the morning, at a declination of 7° 21' north, and cannot claim any especial attention at present.

Neptune is in R. A. 2h. 39m; Dec. 13° 36' north. It reaches quadrature on the 30th, and will be found in conjunction with the Moon on—Feb. 4th.

In the *Popular Science Monthly* for January, 1881, Dr. Leonard Waldo gives an interesting description of the method employed at the Yale Observatory, for comparing with the standards of that institution, thermometers which have been sent there for verification by physicians, instrument makers and others. He calls attention to the fact that thermometers, even if from makers of established reputation, are liable to errors much greater than is commonly supposed, and he points out the necessity of having such errors carefully determined.

WE learn from the *Comptes Rendus* that Janssen has made preparations at Meudon to repeat Dr. Draper's experiments on the photography of the Nebula in Orion, and that for this purpose he proposes to construct upon a large scale a telescope of short focus quite similar to the one with which he obtained a very luminous spectrum of the Corona, in 1871. Janssen has also made some experiments in photographing the chromosphere. The exposure is continued so long that the solar image becomes positive to the very circumference, without going beyond it. The chromosphere is then shown in the form of a dark ring with a thickness of 8" or 10". He has compared positive and negative solar photographs taken on the same day and with the same instrument, and the measurement of the diameter shows that the dark ring in question is wholly outside of the solar disk.

DR. WARREN DE LA RUE has been elected a corresponding member of the Paris Academy of Sciences in the section of Astronomy, and M. Sella a corresponding member in the section of Mineralogy.

THE Rumford medal of the Royal Society has been awarded to Dr. William Huggins for his work on celestial spectroscopy, and the Copley medal to Prof. J. J. Sylvester of Johns Hopkins University for researches in pure mathematics.

W. C. W.

## ECLIPSE OF THE SUN.

To the Editor of "SCIENCE":

I would like to add a sentence to the fourth paragraph of my letter in last week's "SCIENCE" giving my observations of the recent partial eclipse of the sun. After the words "solar limb" I would add, "on the eastern side of the sun the phenomenon was considerably less prominent and only visible at the time of greatest obscuration, and when the slit was quite close to the sun's limb."

L. TROUVELOT.

CAMBRIDGE, January 12, 1881.